

THE EFFECTS OF CHEMICAL TONERS ON COLD AND WARM TONE  
PHOTOGRAPHIC BLACK AND WHITE FIBER BASE  
ENLARGING PAPERS

by

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Submitted to the Department of Architecture on May 8, 1983  
in partial fulfillment of the requirements for the degree  
Master of Science in Visual Studies

ABSTRACT

What this thesis attempts to present is a systematic and ordered assembling of different true chemical toners on two types of black and white enlarging papers with two different developers. It is my hope that this study will be of some use as a reference in what effect it is possible to achieve with different combinations of toners, papers, and developers. Although not all possible combinations have been tried, most color choices are represented and I decided to display the same image repeatedly. A conventional paper developer, Kodak Dektol, as well as a developer of somewhat higher quality with a Glycin base, GAF 130, were used. Each respective thesis has its own enlarged and toned black and white photographic prints. An attempt has been made to try to report results clearly and factually, and to try to keep this paper as visual as possible. All toners are found with their respective formulas and all information necessary to duplicate results is supplied.

I felt it was necessary to display the real effect of toners upon modern photographic materials because of their inherent capability to alter a conventional black and white photographic print. This alteration will ultimately affect the response of the viewer through the emotional impact of color.

Thesis Supervisor: Michael Bishop  
Title: Associate Professor of Photography

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## INTRODUCTION

The negative used in this thesis was Kodak's Plus-X in 120 mm film size. It was developed in Ilford ID-11 Plus Film Developer at 1:1 dilution for 4 minutes and 15 seconds with constant agitation at 68°F, and stopped, fixed, hypo-cleared and washed conventionally. The prints were made with a Beseler MCRX enlarger adapted with an Aristo D-2 Cold Light Head. The enlarging lens was an 80 mm Nikor f5.6.

For clarity and optimum results, I felt it necessary to use an enlarging paper of extremely high quality. I therefore chose ORIENTAL CENTER (in its F3 gradation) as a warm tone enlarging paper. Center is peculiar in its being a warm tone paper on a white base. As a cold tone enlarging paper, I picked ORIENTAL SEAGULL for its brilliance and extremely white base. I used Seagull in its G3 gradation. Both are chlorobromide papers and very susceptible to toning. I used them in 11x14 size, double weight, glossy surface.

I thought it was crucial that I use two different types of print developers. Kodak's DEKTOL is an industry standard, available anywhere and is, according to Kodak, "a prepared, single-powder developer that produces neutral and cold tone images on cold tone papers." The other type of developer used is mixed from a formula and it is a glycin based developer



called GAF 130. Its advantages are the ability to control contrast through dilution and length of developing time, an unusually long tray life and an extremely rich tonal range. It gives rich black tones with excellent brilliance and detail. Here is the formula to make 1 liter of stock solution:

#### Stock Solution

Water (125°F/52°C . . . . .	750 mL
Metol . . . . .	2.2 grams
Sodium Sulfite, dessicated . . . . .	.50 grams
Hydroquinone . . . . .	.11 grams
Sodium Carbonate, monohydrate . . . . .	.78 grams
Potassium Bromide . . . . .	5.5 grams
Glycin . . . . .	.11 grams
Add cold water to make . . . . .	1 liter

Start by adding a pinch of sodium sulfite in the storage container with the hot water to minimize the initial oxidation of the metol. Add the metol to the solution and stir until all of the metol is dissolved. It is important that all of the metol be dissolved before the other chemicals are added. After the metol has dissolved add the sodium sulphite and stir until the solid dissolves. Add each chemical consecutively in the order given above. Make sure each chemical is completely dissolved before adding the next one. Finally, add cold water to the solution to bring its final volume up to one liter. The brown color of the stock solution in no way

means the developer is exhausted. The stock solution has a life of more than six months and the working solution has a tray life of one to two months. GAF 130 has a capacity of about 50 8x10 prints per liter of stock solution.

Dektol was used at the standard 1:2 dilution and GAF 130 was used at the normal dilution of 1:1 for average printing contrast.

The following table explains the different exposure and developing times of the two developers with the two types of enlarging papers.

Paper	Exposure Time	f/STOP	Developer	Developer Dilution	Developing Time
Center F3	5.6 sec	f11	Dektol	1:2	2 min
Center F3	6.1 sec	f11	GAF 130	1:1	3 min
Seagull G3	6.6 sec	f16	GAF 130	1:1	3 min
Seagull G3	6.4 sec	f16	Dektol	1:2	2 min

If lighter prints are needed, as some toners require because of their intensifying effect, subtract 10% from the initial exposure. (Most of the gold toners will intensify the print somewhat.) On the other hand, if prints have to be slightly darker due to the lightening of the sulfide toners, add 10% to the normal exposure time.

As a stop bath I used 28% Glacial Acetic Acid diluted

2 oz to 1 gallon for about 30 seconds. I fixed the prints in Sprint Speed Fixer diluted 1:4 for 30 seconds without a hardener. Occasionally a toner will required the use of a hardener as in the Liver of Sulphur toner. In such a case, add 3-1/2 oz of Kodak Hardener to 1 gallon of film strength fixer. This will prevent excessive softening of the emulsion. In some other instances, it is recommended to use a plain, non-acid fixing bath like sodium thiosulfate for about 10 minutes. (To prepare a fixing solution, dissolve 100 grams of sodium thiosulfate crystals in 1000 mL of water.) In any case the use of different fixing procedure will be listed with every individual toned image. After fixing wash in running water for about 5 minutes. I then hypocleared the prints in Kodak Hypoclearing Agent for 3 minutes with agitation. I finally washed the prints for 30 minutes in an East Street design washer. After 30 minutes of washing, a residual hypo test indicated that no trace of fixer was to be found in the prints.

## THE TONERS

Traditionally, the color of a black and white print can be altered by three different methods: 1) a specific paper and developer combination; 2) what I will call 'true' chemical toners; 3) mordanted dye toners. In this study I did not

consider the mordanted dye toners for several reasons. Although dye toners provide a broad range of vivid colors, they are often lacking in long-term stability, particularly on prolonged exposure to light. They also tend to be more soluble than other toners in the final wash and often the paper base of the toned prints retains traces of the dye color even after thorough washing. On the other hand, 'true' chemical toners work directly on the silver in the emulsion and are characteristically stable. Some of these toners, like the bleach and redevelop ones, replace the silver in the emulsion with another chemical, for example, sulfide, and are therefore extremely permanent as no metal is present anymore. Some others work through the addition of another metal to the existing silver, such as gold, forming a new compound which is also exceptionally stable. 'True' chemical toners are able to produce subtle and muted colors, as well as vivid and extremely brilliant ones. They act on the deposited silver of the print leaving the paper base and highlights clear and white.

What the reader will find in these following pages is a description, literal and visual, of the following 'true' chemical toners:

- Blue Toning with Thiocarbamide and Gold Chloride
- Copper Toner for Browns and Reds
- The Defender Formula  
     (B1-T1; B1-T1 with Gold Tone Modifier; B3-T2 with  
     Gold Tone Modifier)

- Formulary Gold 231
- GP-1 Gold Protective Toner
- Hypo-Alum Sepia Toner
- Iron Blue Toner
- Kodak Blue Toner T-26
- Kodak Brown Toner
- Kodak Rapid Selenium Toner
- Kodak Sepia Toner
- Liver of Sulphur Toner
- Nelson Gold Toner
- Red Tones with Thiocarbamide and Gold Chloride (Sepia first)
- Selenium Bleach and Redevelop Toner

All toners were mixed and diluted with distilled water.. Four of them are prepackaged: Formulary Gold 231 (available from "Photographer's Formulary," see 'Where to find photographic chemicals and supplies' on p.202); Kodak Brown Toner; Kodak Rapid Selenium Toner; Kodak Sepia Toner. All of the other toners were mixed from raw chemistry.

#### SOME NOTES ON SAFETY

Wet or dry, the concentrated chemicals used for photographic purposes are potentially dangerous if carelessly handled. Some specific groups of chemicals need special

care when used. These are: (1) Acids; (2) Hydroxides; (3) Sulfides; and (4) Thiourea and Paraphenylenediamine compounds. In addition, all solutions containing a metallic chemical element are toxic and the poisonous metallic elements can be absorbed through the skin. Three basic rules to be observed are usually sufficient to make darkroom work safe: (a) rubber gloves; (b) goggles to protect the eyes; (c) a mask and/or good ventilation in order to avoid breathing dust or vapor.

Acids. One basic rule should always be remembered when diluting acids: add acids to water, never water to acids. Plain water, suddenly added to a container of pure acid, can react violently. Glacial Acetic Acid in a 28% solution, commonly used in stop baths, is corrosive and should be handled with care. Oxalic Acid is an organic acid which is quite poisonous. Three acids used in photography are extremely dangerous: Hydrochloric, Nitric, and Sulfuric Acid. Any of these are capable of causing skin burns or blindness, and the fumes of Nitric and Hydrochloric Acid may cause damage if inhaled. Sulfuric Acid may overheat when mixed with water and spatter. Good ventilation, immediate access to running water, and proper protection for the eyes are strongly recommended when handling acids, especially in a concentrated form.

Hydroxides. Hydroxides are extremely caustic and by definition capable of dissolving protein, including animal

tissue. The dry material is hygroscopic, and will absorb water from the air or body to form a caustic liquid very readily. Solutions of the hydroxides, if spilled on the skin, will slowly dissolve it, and if splashed in the eye, can cause blindness in a short time. Commonly used hydroxides in photographic practice include Ammonium Hydroxide solution, Lithium Hydroxide, Potassium Hydroxide, and Sodium Hydroxide. To dissolve the hydroxide simply stir the pellets into the solvent. It will dissolve very readily and it will not be necessary to pulverize the pellets or flakes. Large amounts of heat are liberated when hydroxides are dissolved. It is therefore prudent to use ice or very cold water and to dissolve a portion of the hydroxide at a time, allowing the solution to cool before proceeding. In addition, dispose of the hydroxide solutions by flushing down the sink with large amounts of water. The use of safety glasses and rubber gloves is strongly recommended when handling hydroxides in any form.

Sulfides. Sulfides of different kinds are used in photography, with Sodium Sulfide and Polysulfide most often used in toning processes. Sulfides may be dangerous as caustic solids or liquids or as a very poisonous gas, and the fumes will fog photo-sensitive emulsions. It is safer to dissolve caustics in cold water as considerable heat may evolve. It is also prudent to dissolve the sulfide a bit at a time or to use ice water when making concentrated solutions.

Fumes of sulfide solutions are very noxious, but when a sulfide contacts an acid the gas generated by the reaction becomes an exceptionally powerful poison. It is therefore essential that acids and sulfides are not allowed to contact each other in significant quantity. Never allow a sulfide to follow an acid down the drain, or vice versa. This would allow the poisonous gas to be generated in the sewer and to be backed-up into the home. Good ventilation is essential, as well as goggles and rubber gloves in order to make the use of sulfides or any sort of caustics safe and usable.

Thiourea (Thiocarbamide). Thiourea is a carcinogen. It is therefore important that this carcinogenic chemical not be allowed to build up on clothing or in the work area. Thiourea (which is also called Thiocarbamide) should not be permitted to contact skin or enter the body. Gloves are a must, and the chemical should be handled with caution when scaling so as to avoid stirring up dust. Spills should be cleaned up before they have a chance to dry, and spent solutions should be disposed of with lots of water to prevent the accumulation of residues. Used solutions should also be discarded.

All substances can be dangerous; they can, however, be made safe by following simple precautions. It is essential to always know what chemical is involved in each formula and



how to handle it. In the toners that I present in this study, I have used at least one chemical substance of each of the groups described above and I haven't had any problem. With reasonable care, any photographic chemical can be made safe to handle.

## TONING CHART

Toner	Number of Baths	Color	Temperature
Blue Toning with Thiocarbamide and Gold	1	Blue-gray	96°F
Copper Toner for Browns and Reds	1	Warm brown to copper to pink	70°F
The Defender Formula B1-T1	2	Warm brown with a hint of red to cool purple brown	70°F
The Defender Formula B1-T1 with Gold Tone Modifier	3	Pinkish red to purple	70°F
The Defender Formula B3-T2 with Gold Tone Modifier	3	Reddish yellow to gold brown	70°F
Formulary Gold 231	1	Deep blue-black with greenish tinge to cool blue-black	70°F
GP-1 Gold Protective Toner	1	Subtle gray-blue	70°F
Hypo-Alum Sepia Toner	1	Light warm brown to cool rich brown	115°F
Iron Blue Toner	1	Intense blue	68°F
Kokak Blue Toner T-26	1	Blue-gray	102°F
Kokak Brown Toner	1	Rich warm brown	70°F

Toner	Number of Baths	Color	Temperature
Kodak Rapid Selenium	1	Split purplish color	70°F
Kokak Sepia Toner	2	Light warm brown to rich cool brown	70°F
Liver of Sulphur Toner	1	Slightly split rich warm brown to smooth cool brown	68°F
Nelson Gold Toner	1	Subtle warm brown to moderate cool brown	110°F
Red Tones with Thiocarbamide and Gold Chloride (Sepia first)	3	Orange-red chalk to intense red	96°F
Selenium Bleach and Redevelop Toner	2	Reddish-brown to cool purple brown	70°F

## THE FOUR UNTONED PRINTS

These prints serve as a reference. They show the color of an untuned print in any of the paper/developer combinations used.

Paper	Developer	Page
Center F3	Dektol	14
Center F3	GAF 130	15
Seagull G3	GAF 130	16
Seagull G3	Dektol	17











## BLUE TONING WITH THIOCARBAMIDE AND GOLD CHLORIDE

I found this toner to be excellent for soft grayish blues. The formula is easy to mix and the results are quite consistent.

Three stock solutions are made up as follows:

## Stock Solution A

Thiocarbamide*	. . . . .	3.25 grams
Water	. . . . .	240 mL

## Stock Solution B

Citric Acid	. . . . .	3.25 grams
Water	. . . . .	240 mL

## Stock Solution C

Gold Chloride	. . . . .	1 gram
Water	. . . . .	240 mL

For use: take one ounce of each of these stock solutions and add ten ounces of water, making 13 ounces in all. This quantity will tone from 2 to 4 11x14" prints or an equivalent

\*Note: Thiocarbamide and Thiourea are the same chemical.

area in from 15 to 30 minutes. By warming the solution to about 90°F the action can be speeded up a little. I used the toner at a temperature of 96°F and toned Center for 10 minutes and Seagull for 15 minutes. I used a water jacket and stainless steel trays to keep the solution warm and I agitated the prints constantly. With 26 ounces of working solution I was able to tone about 6 prints. I used slightly lighter prints because of the intensifying effect that most blue toners have. However I found 10% less exposure to be too light for this toner as the intensification is slight. Therefore tone prints that are normally exposed or just slightly lighter than normal.

I found the toner produced very smooth, brilliant, and elegant prints. In addition, the mixing of the formula is easy and fast, and the stock solution will last for a long time. However it is also a fairly expensive toner: the working solution exhausts quickly because of the deposit of the gold chloride to the silver content of the print. Nevertheless the effects of the toner are of extreme clarity and beauty, and the same toner can be used on prints that have been first sepia toned to produce unusual chalk orange-red tones.

TONER: BLUE TONING WITH THIOCARBAMIDE AND GOLD CHLORIDE

Print page number : 21

Paper . . . . . : Center F3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 96°F

Toner, time . . . : 10 minutes

. . . . .

#### Observations:

The toner produces a beautiful smooth and soft blue-gray color. The effect is a luminous, clear and cool print. The toner acts slowly but constantly and the print can be removed anytime. With longer toning times the print will become progressively bluer.

Final wash: 30 minutes



TONER: BLUE TONING WITH THIOCARBAMIDE AND GOLD CHLORIDE

Print page number : 23

Paper . . . . . : Center F3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 96°F

Toner, time . . . : 10 minutes

. . . . .

Observations:

The effects of the toner on this paper-developer combination are very similar to the results obtained with Center and Dektol except for more contrast, probably due to the use of GAF 130.

Final wash: 30 minutes



TONER: BLUE TONING WITH THIOCARBAMIDE AND GOLD CHLORIDE

Print page number : 25

Paper . . . . . : Seagull G3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 96°F

Toner, time . . . : 15 minutes

. . . . .

#### Observations:

A less intense blue tone is achieved with this paper and both developers. The toner seems also to intensify the print less than with Center and the resulting color is a more cold metallic blue.

Final wash: 30 minutes







TONER: BLUE TONING WITH THIOCARBAMIDE AND GOLD CHLORIDE

Print page number : 27

Paper . . . . . : Seagull G3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 96°F

Toner, time . . . : 15 minutes

. . . . .

Observations:

No difference could be noticed on this paper with the use of a different developer.

Final wash: 30 minutes



## COPPER TONER FOR BROWNS AND REDS

The range of tones that can be obtained by copper toning is a wide one, from a slightly warm brown tint, to a strong coppery color, to a red chalk or even a hot pink. Copper toning is comparatively inexpensive, it is usually fast-working and its results are permanent. It is of proven usefulness with virtually all modern papers, including the RC types. The color obtained depends upon the length of time the toner is allowed to act.

Two stock solutions are needed. They are:

## Solution A

Warm water . . . . .	750 mL
Copper Sulfate* . . . . .	6.2 grams
Potassium Citrate . . . . .	25 grams
Water to make . . . . .	1 liter

Dissolve the 6.2 grams of copper sulfate in the 750 mL of water. Add the 25 grams of potassium citrate. Add water to make one liter.

\*Copper sulfate is a poison, it may be fatal if swallowed. Do not breathe dust or vapor, and avoid contact with skin or clothing.

## Solution B

Warm water . . . . .	750 mL
Potassium Ferricyanide . . . . .	5.2 grams
Potassium Citrate . . . . .	25 grams
Water to make . . . . .	1 liter

To use simply take equal parts of A and B and combine at the time of use. Immerse the print, which must be properly fixed and thoroughly washed. It will soon begin to tone: the print may then be removed whenever the desired tone is obtained. In order to be able to watch any color change closely, it is advisable to tone one print at the time. If the print is pinkish in the highlights it may be because it was not completely fixed or thoroughly washed or it may be that not enough potassium citrate is being used for that specific type of paper. Increasing the citrate level in either solution will help prevent such tinging of the whites.

The toner will gradually decompose and lose its effectiveness.

I noticed a perceptible lightening of the image after toning. If re-intensification is desired, place the print in the following solution:

Water . . . . .	800 mL
Copper Sulfate . . . . .	50 grams
Potassium Bromide . . . . .	25 grams

Glacial Acetic Acid 28% . . . . .	50 mL
Water to make . . . . .	1 liter

Prepare fresh before use and wash the prints for at least half an hour after use.

This being a fast acting and strong toner, I elected to give examples of two different toning times, one and two minutes respectively

I found Copper Toner to be quite unique. Because of its inherent rapidity, it will be somewhat tricky to get consistent results. In addition, a very small change in toning time will produce different colors than the ones shown hereafter. If the desire is to produce strong red or pink colors intensification with the above formula will be necessary due to excessive bleaching.

TONER: COPPER TONER FOR BROWNS AND REDS

Print page number : 32

Paper . . . . . : Center F3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 minutes, no hardener

Toner, temperature: 70°F

Toner, time . . . : 1 minute

. . . . .

Observations:

The result is a soft and smooth warm brown. Although the toning time is quite short, the toner seems to have taken evenly.

Final wash: 45 minutes



TONER: COPPER TONER FOR BROWNS AND REDS

Print page number : 34

Paper . . . . . : Center F3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : 2 minutes

. . . . .

#### Observations:

Compared to the one minute toned image the print has turned considerably red. It is a gentle and soft brownish red. The print has also lost some of its intensity.

Final wash: 45 minutes





TONER: COPPER TONER FOR BROWNS AND REDS

Print page number : 36

Paper . . . . . : Center F3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : 1 minute

. . . . .

Observations:

The result is a soft and smooth warm brown with an almost imperceptible reddish tinge.

Final wash: 45 minutes



TONER: COPPER TONER FOR BROWNS AND REDS

Print page number : 38

Paper . . . . . : Center F3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : 2 minutes

. . . . .

#### Observations:

The color obtained with this combination and toning time is a weak bleached pink brown. Toning for this long or longer with this paper and this developer is not recommended without the use of the intensifier described under the Copper Toner description section.

Final wash: 45 minutes





TONER: COPPER TONER FOR BROWNS AND REDS

Print page number : 40

Paper . . . . . : Seagull G3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : 1 minute

. . . . .

#### Observations:

In one minute the print is toning a smooth, cold brown. A slight pinkish cast seems to reside on the surface of the print. The results of the print with the 2 minutes toning time will bear this out.

Final wash: 45 minutes



TONER: COPPER TONER FOR BROWNS AND REDS

Print page number : 42

Paper . . . . . : Seagull G3

Developer . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : 2 minutes

. . . . .

#### Observations:

After one minute of toning the image was toned a smooth cold brown. After 2 minutes of toning the print is visibly split toned giving the effect of the cold brown color "sitting underneath" a copper red cast. Longer toning times would smooth this red color but would bleach as well. Print intensification would become necessary.

Final wash: 45 minutes





TONER: COPPER TONER FOR BROWNS AND REDS

Print page number : 44

Paper . . . . . : Seagull G3

Developer . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : 1 minute

. . . . .

#### Observations:

Below a very slight copper reddish tinge resides a cold brown tone. The toner seems to act more quickly with this combination than with Seagull and GAF.

Final wash: 45 minutes



TONER: COPPER TONER FOR BROWNS AND REDS

Print page number : 46

Paper . . . . . : Seagull G3

Developer . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : 2 minutes

. . . . .

#### Observations:

This print is the most copper red toned of any in this test. It is extremely pink and bleached. The intensifying step will be necessary. In addition the toning is not yet even.

Final wash: 45 minutes





## THE DEFENDER FORMULA

This series of toning formulas (3 bleaches and 3 redevelopers) was originally invented for use with DuPont "Varigam" paper, a kind of paper that the Defender Photo Supply Co., later called DuPont Photographic Products, brought out in 1940. They give a complete range from a light golden brown or light reddish brown through intermediate shades to a deep cold brown to a bright maroon. The formula consists of 3 bleaches and 3 redevelopers which can be combined to obtain different results. A Gold Tone Modifier can be used after toning in order to replace the golden tint with a reddish one. Toning is accomplished in two or three stages: bleaching (B), toning (T), and, if desired, gold modifying (G). Any combination of bleaching-toning-gold modifying can be used. Following this description I will give samples of the B1-T1 combination as well as B1-T1 with Gold Tone Modifier and B3-T2 with Gold Tone Modifier. Here are the formulas:

## B (Bleach)

B1. Water. . . . .	750 mL
Potassium Ferricyanide . . . . .	22 grams
Potassium Bromide. . . . .	25 grams
Water to make. . . . .	1000 mL

B2. Water . . . . . 750 mL  
 Potassium Ferricyanide. . . . . 22 grams  
 Potassium Iodide. . . . . 10 grams  
 Water to make . . . . . 1000 mL

B3. Water . . . . . 750 mL  
 Potassium Ferricyanide. . . . . 22 grams  
 Sodium Chloride (Table salt). . . . . 35 grams  
 Nitric Acid . . . . . 15 mL  
 Water to make . . . . . 1000 mL

Prints should be thoroughly fixed and washed prior to bleaching. The use of a non-hardened fixer is strongly recommended. After washing, prints are bleached in one of the above baths until no further bleaching action can be noticed. Then rinse the print in running water for about 3 minutes or until the image is free from the yellow color of the bleach. Special care should be taken if using B3 when handling Nitric Acid. I suggest the use of goggles, rubber gloves and mask. Good ventilation is also recommended. (Note: B3 will leave prints with a greenish tint after bleaching. It will disappear in the toner.)

After bleaching and rinsing, the print is placed in one of the following toning baths and left until toning is complete.

## T (Toner)

T1.	Water . . . . .	750 mL
	Thiocarbamide (Thiourea). . . . .	3 grams
	Sodium Hydroxide. . . . .	6 grams
	Water to make . . . . .	.1000 mL
T2.	Water . . . . .	750 mL
	Thiocarbamide (Thiourea). . . . .	3 grams
	Sodium Carbonate. . . . .	45 grams
	Water to make . . . . .	.1000 mL
T3.	Water . . . . .	750 mL
	Thiocarbamide (Thiourea). . . . .	3 grams
	Potassium Carbonate . . . . .	.48 grams
	Water to make . . . . .	.1000 mL

(Extreme care should be taken when handling Sodium Hydroxide (T1). The use of safety goggles and gloves is strongly recommended. In addition, special attention should be given when handling Thiocarbamide (Thiourea) as this compound is a carcinogen.)

Various combinations of bleach and tone will give different tones. After toning, prints should be washed well for at least 30 minutes. They may then be dried or gold tone modified



as desired. If the Gold Tone Modifier is used, prints should first be immersed in a 3% sodium chloride solution:

Water . . . . .	750 mL
Sodium Chloride (Table salt). . . . .	30 grams
Water to make . . . . .	1000 mL

I immersed the prints in this solution for about 2-3 minutes with agitation. Rinse briefly. The prints are now ready to be gold toned in the following solution:

#### G (Gold Tone Modifier)

Gold Chloride . . . . .	1 gram
Potassium Thiocyanate . . . . .	6 grams
Water to make . . . . .	1000 mL

I used the Gold Toner at a temperature of 70°F for from 6 to 10 minutes. The Gold Tone Modifier gives prints additional brilliance and excellent permanence; prints that are just bleached and toned are permanent as well. After Gold Toning wash for 45 minutes. Results should be evaluated when prints are dry.

Although I did not try all possible combinations, I found these formulas to be of extreme flexibility and variability.

Brown, red, gold and orange colors can be achieved by combining bleaches with toning and the Gold Tone Modifier. Even the use of a different developer with the same kind of paper sometimes produces a different tone. Moreover, results are constant and repeatable. It is my hope that my experimenting with this toner will lead the reader to further investigate the numerous interesting combinations of these formulas.

TONER: THE DEFENDER FORMULA B1-T1

Print page number : 53

Paper . . . . . : Center F3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: Bleach: 70°F, Toner: 70°F

Toner, time . . . : to completion (about 30 seconds to 1 minute)

. . . . .

#### Observations:

The result is excellent saturated warm brown with a hint of red. The whites are clear and the print is very smooth. There is no apparent loss of density in the blacks as in Kodak's Sepia Toner.

Final wash: 45 minutes



TONER: THE DEFENDER FORMULA B1-T1

Print page number : 55

Paper . . . . . : Center F3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: Bleach: 70°F, Toner: 70°F

Toner, time . . . : to completion (about 30 seconds to 1 minute)

. . . . .

#### Observations:

The brown achieved with this paper-developer combination is cooler and slightly redder. The print is very luminous and clear.

Final wash: 45 minutes



TONER: THE DEFENDER FORMULA B1-T1

Print page number : 57

Paper . . . . . : Seagull G3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: Bleach: 70°F, Toner: 70°F

Toner, time . . . : to completion (about 30 seconds to 1 minute)

. . . . .

Observations:

The results are a beautiful, rich, and cool purple brown.

Final wash: 45 minutes







TONER: THE DEFENDER FORMULA B1-T1

Print page number : 59

Paper . . . . . : Seagull G3

Developer . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: Bleach: 70°F, Toner: 70°F

Toner, time . . . : to completion (about 30 seconds to 1 minute)

. . . . .

#### Observations:

Compared to the Seagull-GAF combination, the print is slightly "warmer" but the color is, again, a deep and rich dark purple brown.

Final wash: 45 minutes



TONER: THE DEFENDER FORMULA B1-T1 WITH GOLD TONE MODIFIER

Print page number : 61

Paper . . . . . : Center F3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: Bleach: 70°F, Toner: 70°F,  
Gold Tone Modifier: 70°F

Toner, time . . . : Bleach and Toner to completion;  
Gold: 6 minutes

. . . . .

#### Observations:

The color achieved is a unique pinkish red. After 6 minutes of gold toning, the print seems slightly split; the Gold Tone Modifier acts quite strongly in the middle-gray areas.

Final wash: 45 minutes



TONER: THE DEFENDER FORMULA B1-T1 WITH GOLD TONE MODIFIER

Print page number : 63

Paper . . . . . : Center F3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: Bleach: 70°F, Toner: 70°F,  
Gold Tone Modifier: 70°F

Toner, time . . . : Bleach and Toner to completion;  
Gold: 6 minutes

. . . . .

#### Observations:

The color achieved with this paper-developer combination is a rich and cold maroon. The print is clear and luminous and some of the areas with maximum density seem coated with a dark red layer. This leads me to think that the Gold Tone Modifier splits slowly but progressively, and that the ultimate color, if toning were continued, would be a deep and rich dark red.

Final wash: 45 minutes





TONER: THE DEFENDER FORMULA B1-T1 WITH GOLD TONE MODIFIER

Print page number : 65

Paper . . . . . : Seagull G3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: Bleach: 70°F, Toner: 70°F,  
Gold Tone Modifier: 70°F

Toner, time . . . : Bleach and Toner to completion;  
Gold: 8 minutes

. . . . .

#### Observations:

This toner on this paper produces a glowing and saturated purple. The print is smooth and brilliant. A dark purple layer is apparent in the blacks as though it had been hand applied.

Final wash: 45 minutes





TONER: THE DEFENDER FORMULA B1-T1 WITH GOLD TONE MODIFIER

Print page number : 67

Paper . . . . . : Seagull G3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: Bleach: 70°F, Toner: 70°F,  
Gold Tone Modifier: 70°F

Toner, time . . . : Bleach and Toner to completion;  
Gold: 8 minutes

. . . . .

#### Observations:

Because of the use of Dektol, the color obtained on this print is a slightly warmer purple than the one obtained on the Seagull-GAF print.

Final wash: 45 minutes



TONER: THE DEFENDER FORMULA B3-T2 WITH GOLD TONE MODIFIER

Print page number : 69

Paper . . . . . : Center F3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: Bleach: 70°F, Toner: 70°F,  
Gold Tone Modifier: 70°F

Toner, time . . . : Bleach: to completion (about 1 minute);  
Toner: to completion; Gold: 10 minutes

. . . . .

#### Observations:

The toned print is slightly bleached; it is therefore recommended to start off with a somewhat darker print (about 5% more exposure than a normal print). The color achieved is a reddish yellow. Blacks are not very deep due to the bleaching. Also noticeable is a small loss in contrast.

Final wash: 45 minutes



TONER: THE DEFENDER FORMULA B3-T2 WITH GOLD TONE MODIFIER

Print page number : 71

Paper . . . . . : Center F3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: Bleach: 70°F, Toner 70°F,  
Gold Tone Modifier: 70°F

Toner, time . . . : Bleach: to completion (about 1 minute);  
Toner: to completion; Gold: 10 minutes

. . . . .

#### Observations:

The color obtained is a light yellow with a tinge of red. Again, the print is noticeably bleached. Start off with 5% more exposure.

Final wash: 45 minutes





TONER: THE DEFENDER FORMULA B3-T2 WITH GOLD TONE MODIFIER

Print page number : 73

Paper . . . . . : Seagull G3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: Bleach: 70°F, Toner: 70°F,  
Gold Tone Modifier: 70°F

Toner, time . . . : Bleach: to completion (about 5 minutes),  
Toner: to completion, Gold: 10 minutes

. . . . .

#### Observations:

The results are an incredible golden brown with a subtle cast of red and light yellow. The print is extremely brilliant but also somewhat bleached. I would therefore suggest to start off with a darker print.

Final wash: 45 minutes





TONER: THE DEFENDER FORMULA B3-T2 WITH GOLD TONE MODIFIER

Print page number : 75

Paper . . . . . : Seagull G3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: Bleach: 70°F, Toner: 70°F,  
Fold Tone Modifier: 70°F

Toner, time . . . : Bleach: to completion (about 5 minutes),  
Toner: to completion, Gold: 10 minutes

. . . . .

#### Observations:

No different toning color can be seen on Seagull because of the use of a different developer. However a smaller degree of bleaching occurs with the Seagull/Dektol combination.

I found the resulting color of this toner with this paper very unique and special and unobtainable with any other kind of toner.

Final wash: 45 minutes



## FORMULARY GOLD 231

This formula is equivalent to the Ansco Gold Toner 231. It produces rich blue tones on appropriate papers and it is also used on sepia toned prints for brilliant red tones. Warm tone papers tone more readily than cold tone enlarging papers. In addition, I noticed more intensification on Center than on Seagull. This toner differs quite strongly in its results from Kokak's Blue Toner. Blue Toning With Thiocarbamide and Gold, and the GP-1 toner, by producing a different kind of blue, especially on Center. The ultimate tone of the prints will depend on the paper and the developer used, as well as the developing time. Some papers will respond reluctantly, while others will react well.

Formulary Gold 231 is extremely simple to mix and use. Here is the formula:

Water (125°F/52°C) . . . . .	750 mL
Ammonium Thiocyanate* . . . . .	105 grams
Gold Chloride, 1% solution . . . . .	60 grams
Cold water to make . . . . .	1 liter

\*If preferred, 110 grams of Sodium Thiocyanate or 135 grams of Potassium Thiocyanate may be substituted for the Ammonium Thiocyanate.

To tone, simply immerse the well washed print and agitate until toning is complete. Center was toned in about 4 minutes whereas Seagull responded somewhat quicker (ca. 3 minutes). Results are smooth and consistent and peculiar to this toner.



TONER: FORMULARY GOLD 231

Print page number : 79

Paper . . . . . : Center F3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : 4 minutes

. . . . .

#### Observations:

A rich blue-black with an almost imperceptible dark green tinge is the color obtained. The print is also significantly intensified. I would suggest to start off with 10% less exposure time than normal.

Final wash: 30 minutes





TONER: FORMULARY GOLD 231

Print page number : 81

Paper . . . . . : Center F3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : 4 minutes

. . . . .

#### Observations:

Whereas Dektol on Center gives an intense blue-black, GAF 130 on Center produces a more delicate color, cool and smooth. The print seems to be less intensified.

Final wash: 30 minutes



TONER: FORMULARY GOLD 231

Print page number : 83

Paper . . . . . : Seagull G3

Developer . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : 3 minutes

. . . . .

Observations:

A very cool blue black. The print is luminous and clear.

Final wash: 30 minutes



TONER: FORMULARY GOLD 231

Print page number : 85

Paper . . . . . : Seagull G3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : 3 minutes

. . . . .

#### Observations:

No difference in color can be seen with the use of Dektol on Seagull instead of GAF 130. The print seems just slightly more intensified, probably because Dektol produces less contrast to start off with.

Final wash: 30 minutes





## GP-1 GOLD PROTECTIVE TONER

GP-1 Gold Toner is meant to give maximum protection with a minimum of color shift. It produces a general "cooling" of the image without adding too much color to the print. I found the toner to be subtle and smooth, and the resulting toned images to be very clear and luminous. Because of the use of gold, there is a slight shift toward gray-blue. The toner eliminates the basic greenish color of an untuned Center and the slight brown tinge of an untuned Seagull.

Two different solutions are prepared first, then mixed together.

## Solution 1

Water . . . . .	750 mL
Gold Chloride, 1% solution . . . . .	20 mL

## Solution 2

Water . . . . .	125 mL
Sodium (or Potassium) Thiocyanate . . . . .	10 grams

When the sodium thiocyanate is dissolved, pour Solution 2 into the 75 mL of solution already prepared. Add water to make 1 liter. Stir rapidly and use immediately as it does not keep after mixing.



To use, just immerse the print and agitate for 10 minutes. Then rinse in cold water to stop the action and wash for at least 20 minutes. The capacity of GP-1 depends on the amount of silver in the prints to be toned, but usually a liter of working solution will tone about 8 8x10" prints.

TONER: GP-1 GOLD PROTECTIVE TONER

Print page number : 89

Paper . . . . . : Center F3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : 10 minutes

. . . . .

Observations:

The print is very luminous, and the color obtained is  
a subtle and smooth gray-blue.

Final wash: 30 minutes



TONER: GP-1 GOLD PROTECTIVE TONER

Print page number : 91

Paper . . . . . : Center F3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : 10 minutes

. . . . .

#### Observations:

The print is somewhat more intensified and the blue slightly denser than the Center and Dektol combination. Basically the same soft gray-blue is achieved.

Final wash: 30 minutes



TONER: GP-1 GOLD PROTECTIVE TONER

Print page number : 93

Paper . . . . . : Seagull G3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : 10 minutes

. . . . .

#### Observations:

This toner on Seagull produces a colder color than on Center. From blue it shifts towards a cool gray, and the print is extremely clear and luminous.

Final wash: 30 minutes





TONER: GP-1 GOLD PROTECTIVE TONER

Print page number : 95

Paper . . . . . : Seagull G3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 minutes, no hardener

Toner, temperature: 70°F

Toner, time . . . : 10 minutes

. . . . .

#### Observations:

No significant change is visible because of the use of Dektol. The color obtained is a subtle cool gray with a hint of blue.

Final wash: 30 minutes



## HYPO-ALUM SEPIA TONER

Hypo-Alum Sepia Toner is a direct sepia toner producing brown to reddish-brown tones on almost any print. The basic formula calls for hypo and potassium alum which are the active toning agents. The actual toning is effected by the formation of colloidal sulphur which is formed when the solution containing hypo and alum is heated. The colloidal sulphur reacts directly with silver to form silver sulfide. When the solution is freshly mixed, the toner has a tendency to bleach the first few prints that are toned in it; it is therefore customary to add a small quantity of a solution of silver nitrate in order to ripen the bath and prevent bleaching. Silver nitrate should be handled with care as it can cause skin burns. It is also an oxidizer (it can supply oxygen to a fire). Any excess of silver nitrate should be disposed of down the drain.

To mix the toner, start with

Water (125°F/52°C) . . . . .	750 mL
Sodium Thiosulfate, Pentahydrate . . . . .	150 grams

Place the hot water in a container and add the sodium thiosulfate. Stir until dissolved. When this first solution is ready, add 25 grams of potassium alum and stir. This is

the actual toning bath. However, without sufficient silver in the solution, prints will be bleached rather than toned. Some of the required silver should be added to the bath by mixing a solution of silver nitrate.

Silver Nitrate . . . . .	0.12 grams
Water. . . . .	5 mL

Add the silver nitrate solution to the toning solution. If a precipitate should form, ignore it. Bring the final volume of the bath up to 1000 mL. At this stage the toning solution still needs ripening in order to obtain proper silver equilibrium. Tone several scrap prints first, which will be significantly bleached. As the bath approaches the proper ratio of ingredients, the tone of the scrap prints will improve.

This toner is permanent and has a very high capacity; it can in fact be used for years and it improves with use. Add a little fresh unripened toner solution now and then to maintain its volume.

Because of its slow working nature, Hypo-Alum Sepia Toner should be used at a temperature of 110 to 120°F. Temperatures above 120°F may blister or stain the print. The toner will act in about 10 to 15 minutes; prints should not be toned for more than 20 minutes at 120°F.

To tone, pour the solution in a tray supported by a water

jacket and heat to 120°F. Prints to be toned should be thoroughly fixed and rinsed for a few minutes before being placed in the toning bath. To insure even toning, the prints should be immersed completely and separated occasionally. After toning, prints should be washed for at least 30 minutes and a wet cotton swab can be used to wipe any scum off the print's surface. I toned Center for 8 minutes and Seagull for 11 minutes, both at a temperature of 115°F. Especially with Center, I found that starting off with a darker print would have helped prevent excessive bleaching of the blacks. I would therefore recommend with any warm tone enlarging paper an increase in exposure of 10 to 15%.

To me, this method of sepia toning seems to be slightly superior to Kodak's Sepia Toner, in that it produces clearer results and its browns are generally more pleasing. It is somewhat more tricky to use but it is worth it.

TONER: HYPO-ALUM SEPIA TONER

Print page number : 100

Paper . . . . . : Center F3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 115°F

Toner, time . . . : 8 minutes

. . . . .

#### Observations:

The results are a light warm brown with a slight pinkish cast. The print is luminous and clear, although some bleaching can be noticed, especially in the blacks.

Final wash: 30 minutes





TONER: HYPO-ALUM SEPIA TONER

Print page number : 102

Paper . . . . . : Center F3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 115°F

Toner, time . . . : 8 minutes

. . . . .

#### Observations:

The combination of this toner with Center and GAF 130 gives a slightly cooler color to the print and the brown seems to be somewhat more intense. However, bleaching is still apparent, as well as an overall pinkish tinge. After 8 minutes, no further action of the toner could be noticed.

Final wash: 30 minutes



TONER: HYPO-ALUM SEPIA TONER

Print page number : 104

Paper . . . . . : Seagull G3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 115°F

Toner, time . . . : 11 minutes

. . . . .

#### Observations:

The brown obtained on this paper and GAF 130 is a cool and rich brown which is also slightly pink. Bleaching is less apparent than with Center and the blacks are full and rich in tonality. No further toning could be seen after 11 minutes in the hot solution.

Final wash: 30 minutes



TONER: HYPO-ALUM SEPIA TONER

Print page number : 106

Paper . . . . . : Seagull G3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 115°F

Toner, time . . . : 11 minutes

. . . . .

#### Observations:

No relevant difference can be seen on this paper with the use of a different developer. The brown, however, seems to be somewhat cooler with a slight tinge of red to it.

I think that this toner on this kind of paper gives excellent and brilliant results, somewhat similar to the ones achieved with a gold toner. The prints are clear and smoothly toned, and the whites are luminous.

Final wash: 30 minutes





## IRON BLUE TONER

Iron Blue Toner produces bright intense blue tones. It is a very fast acting toner and works well on most papers. The depth of the blue toning will vary somewhat with the quality of prints toned in it, light prints generally toning to lighter blues. Intensification of the print occurs in toning; consequently, prints should be lighter than the density desired in the final toned print. In addition, prints should be fixed in a non-hardening fixing bath. I used plain hypo (100 grams of sodium thiosulfate in 1000 mL of water) for about 10 minutes, as this formula called for a "plain, non-hardening hypo bath." Right after toning, the paper base will be greenish in appearance, but it will be easily washed out to a clear blue when placed in running water. It is essential that prints be very thoroughly fixed and washed before toning.

The toner is composed of three stock solutions:

## Stock Solution A

Water . . . . .	900 mL
Ferric Ammonium Citrate . . . . .	50 grams
Add cold water to make . . . . .	1 liter

## Stock Solution B

Water, warm . . . . .	900 mL
-----------------------	--------



Potassium Ferricyanide . . . . . 25 grams  
 Add cold water to make . . . . . .1 liter

#### Stock Solution C

Water, cold . . . . . 990 mL  
 Hydrochloric Acid, concentrated . . . . . .10 mL  
 To make . . . . . 1 liter

(Note: Hydrochloric acid in concentrated form is quite powerful and should be handled with due care. Use gloves, goggles and if possible wear a mask. Avoid breathing the vapor. Keep in a very tightly closed container and loosen closure cautiously. Do not allow water to get into container because of possible violent reaction.)

To tone, use glass, porcelain, enamel, or plastic trays, but never any tray that has any metal showing. Also, do not work in direct sunlight or stains may occur. To use the toner start with 550 mL of water at about 68°F/20°C. Add to it 75 mL of Stock Solution A. Then add 75 mL of Stock Solution B. Finally add 300 mL of Stock Solution C and use immediately. (Do not mix the chemicals in any order other than the one given here.) Toning will take from about half a minute to one minute. After toning wash the prints thoroughly and discard the working solution as it will not keep. On the other hand, stock solutions will last for quite a long time.

Iron Blue Toner is not considered a very permanent toning method. After a while (which sometimes means a year), a metallic shine will start to appear on the surface of the print. This is a sign that the toned print is being affected by atmospheric conditions. Professor Michael Bishop of the Creative Photography Laboratory at MIT suggested the use of a coating of wax which would protect the print effectively against such lack of permanence.

I found Iron Blue Toner to produce one basic blue tonality with some slight variations due to the use of different kinds of paper and developer. Because of its fast acting nature, results are quite tricky to duplicate and not always consistent. The resulting color, which might be considered pleasing or not pleasing, is a very unique and brilliant blue.

TONER: IRON BLUE TONER

Print page number : 111

Paper . . . . . : Center F3

Developer . . . . : Dektol

Fixer . . . . . : 10% Sodium Thiosulfate Solution, 10 minutes,  
no hardener

Toner, temperature: 68°F

Toner, time . . . : 30 seconds

. . . . .

Observations:

A very intense deep blue.

Final wash: 45 minutes



TONER: IRON BLUE TONER

Print page number : 113

Paper . . . . . : Center F3

Developer . . . . . : GAF 130

Fixer . . . . . : 10% Sodium Thiosulfate Solution, 10 minutes,  
no hardener

Toner, temperature: 68°F

Toner, time . . . : 30 seconds

. . . . .

#### Observations:

The use of GAF 130 gives the print somewhat more brilliance because of the increased contrast inherent in the developer. Basically the same color as with Dektol is obtained.

Final wash: 45 minutes



TONER: IRON BLUE TONER

Print page number : 115

Paper . . . . . : Seagul G3

Developer . . . . . : GAF 130

Fixer . . . . . : 10% Sodium Thiosulfate Solution, 10 minutes,  
no hardener

Toner, temperature: 68°F

Toner, time . . . : 1 minute

. . . . .

#### Observations:

A very intense and brilliant blue. The combination Seagull-GAF produces the most contrasty print because of the high degree of contrast inherent in both the paper and the developer.

Final wash: 45 minutes





TONER: IRON BLUE TONER

Print page number : 117

Paper . . . . . : Seagull G3

Developer . . . . : Dektol

Fixer . . . . . : 10% Sodium Thiosulfate Solution, 10 minutes,  
no hardener

Toner, temperature: 68°F

Toner, time . . . : 30 seconds

. . . . .

#### Observations:

With Dektol, intensification is somewhat stronger and the blue is slightly warmer and more vibrant than on Seagull and GAF.

Final wash: 45 minutes



## KODAK BLUE TONER T-26

This toner has been under proprietary license by Kodak for many years. It is no longer available on the shelf but Kodak has just recently released its formula. Kodak Blue Toner T-26 creates a blue image with gold and because of its high content of gold chloride the toner gives excellent results and permanency. It is also quite expensive.

Here is the formula:

## Part A - Solution

Water . . . . .	31.0 mL
Gold Chloride*. . . . .	0.4 gram

## Part B - Powder

Thiourea. . . . .	.1.0 gram
Tartaric Acid . . . . .	.1.0 gram
Sodium Sulfate, Anhydrous . . . . .	15.0 gram

Kodak's Guide for "Quality Enlarging with Kodak B/W Papers" explains procedures for mixing and use. Dissolve the Gold chloride in the water with stirring to make the Part A

\*Gold chloride crystals readily absorb moisture from the air. The crystals should be stored in a tightly sealed moisture-proof container.

solution. Add Part A to one U.S. quart (946 mL) of water at about 125°F (52°C). While stirring, add Part B and continue stirring until the chemicals are dissolved completely.

Note: A fine, white precipitate may appear in the solution when kept overnight. This does not impair the properties of the toner.

If using a 1% gold chloride solution, use 40 mL of this solution as Part A and add to 937 mL of water to make a total of 977 mL of solution. Then add Part B.

For best results, the solution should be made fresh prior to toning and prints to be toned must be washed free of fixer. Tone for 8 to 45 minutes at 68°F (20°C) or from 100°F to 105°F (38 to 40.5°C) for 2 to 15 minutes. I used the toner at 102°F for about 5 minutes with a water jacket and stainless steel trays. Though the exact color achieved varies with the paper and the developer, the results are generally a soft and smooth gray-blue with a luminosity typical to most gold toned prints.

Prints to be toned should be slightly lighter than normal as some intensification may occur. From five to fifteen 8x10" prints or equivalent can be toned per quart of solution, depending on the degree of toning.

TONER: KODAK BLUE TONER T-26

Print page number : 121

Paper . . . . . : Center F3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 102°F

Toner, time . . . : 5 minutes

. . . . .

#### Observations:

With this paper and developer the toner produces an intense blue-gray and is smooth overall. The whites are basically kept clear and luminous, although the print was slightly intensified by the toning. I also notice a very gentle purplish cast.

Final wash: 30 minutes







TONER: KODAK BLUE TONER T-26

Print page number : 123

Paper . . . . . : Center F3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 102°F

Toner, time . . . : 5 minutes

. . . . .

#### Observations:

Results are somewhat cooler and less purple than with the Center-Dektol combination. There is also a smaller degree of intensification of the print: I assume this is dependent upon the developer used. Basically, though, the color achieved is still a soft and smooth bluish-gray and is a little more brilliant.

Final wash: 30 minutes



TONER: KODAK BLUE TONER T-26

Print page number : 125

Paper . . . . . : Seagull G3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 102°F

Toner, time . . . : 5 minutes

. . . . .

#### Observations:

With this combination of paper and developer, and this temperature and time of toning, prints are "cooled" significantly. The blue is very apparent only if the print is compared to an untuned print. The toned image is subtle, clear and elegant.

Final wash: 30 minutes



TONER: KODAK BLUE TONER T-26

Print page number : 127

Paper . . . . . : Seagull G3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 102°F

Toner, time . . . : 5 minutes

. . . . .

Observations:

Some intensification occurs. Still, the print has a cool, soft and smooth overall blue-gray color.

Final wash: 30 minutes





## KODAK BROWN TONER

Kodak Brown Toner comes as a concentrated liquid and is normally diluted 1:32 with water, although other dilutions are possible. Prints should be hypo cleared and well washed before toning. Any residual fixer will result in staining. It is recommended that rubber gloves be used when handling the concentrated solution and that care be taken that the room be well ventilated. Because Kodak Brown Toner contains potassium sulphide contact with acid such as stop bath will liberate poisonous gas.

To tone, simply immerse the well washed print in the toning solution with agitation until completion. A warmer solution will produce quicker results. Prints to be toned should be slightly darker than normal as they will dry lighter after toning. This toner is effective for protective toning when it is used as recommended.

I used this toner at 1:32 dilution.



TONER: KODAK BROWN TONER

Print page number : 130

Paper . . . . . : Center F3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : 12 minutes

. . . . .

#### Observations:

After 10 minutes there is no apparent change in color. Toning is smooth, consistent and there is little difference due to developers. The end result is a light warm brown tone.

Final wash: After toning, rinse, hypo clear, and wash for 30 minutes.



TONER: KODAK BROWN TONER

Print page number : 132

Paper . . . . . : Center F3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : 12 minutes

. . . . .

Observations:

A slightly cooler brown than with Dektol is obtained with GAF 130. This toner seems to depend more upon type of paper than kind of developer.

Final wash: After toning, rinse, hypo clear, and wash  
for 30 minutes.



TONER: KODAK BROWN TONER

Print page number : 134

Paper . . . . . : Seagull G3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : 20 minutes

. . . . .

#### Observations:

A rich cold brown is obtained with this paper/developer combination. Results are smooth and the print's brilliance seems to be enhanced.

Final wash: After toning rinse, hypo clear, and wash  
for 30 minutes.





TONER: KODAK BROWN TONER

Print page number : 136

Paper . . . . . : Seagull G3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : 20 minutes

. . . . .

#### Observations:

Basically the same results are obtained as with Seagull and GAF 130 except for a hint of warmth in the brown color.

Final wash: After toning rinse, hypo clear, and wash  
for 30 minutes.





## KODAK RAPID SELENIUM TONER

Kodak Rapid Selenium Toner comes in liquid form and is variable in dilution, temperature and length of toning. In its instructions, Kodak recommends a dilution of 1:3 at 70°F and a toning time of 2 to 8 minutes, or a dilution of 1:9 and a toning time of at least 8 minutes at 70°F. This dilution is far too strong for this kind of paper. Therefore, I recommend a weaker concentration of Selenium Toner to water. Also, Kodak Rapid Selenium Toner can be combined with the hypo clearing bath. After fixing, rinse the prints in running water for several minutes, then immerse the print in the combined bath, at anywhere from 1:15 to 1:25 dilution for from 2 minutes to whenever the desired color is reached. Toning should take place in good white light with adequate ventilation. Use gloves; selenium is a heavy metal which accumulates in the body and is not exhausted.

To tone, just immerse the print emulsion side up and use constant agitation. The effect of the toner will start to appear at about 1-1/2 minute. After toning is completed, the print should be rinsed in cold running water (65°F or colder) and then washed thoroughly for standard wash times. Staining may occur with some papers, especially Kodak Polycontrast papers. If this happens, a double hypo clearing bath prior

to toning helps. Also, an alkaline solution of borax and water (about a handfull of borax to one liter of water) can be used after fixing and before toning.

As Kodak states in its "Quality Enlarging with B/W Papers," "Kodak Rapid Selenium Toner usually increases the D-max and contrast, whether there is a change in color or not. Some workers use this toner with neutral or warm-black image-tone papers to increase the tonal scale." Also, this toner "will provide additional protection to the properly processed photographic print."

In conclusion, Kodak Rapid Selenium Toner has proven to be a very flexible and effective toner for its ability to produce various effects: increased permanency with or without color change, intensification of the image, and a shift in color toward purple.

I used the toner at 1:15 dilution.

TONER: KODAK RAPID SELENIUM

Print page number : 140

Paper . . . . . : Center F3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : 3-1/2 minutes

. . . . .

#### Observations:

With this kind of paper and developer, and this dilution, the toner seems to split, e.g., to take in the darks very quickly without affecting the whites. The toning starts to appear after approximately 1-1/2 minutes thereafter changing the darks to purple rapidly. I therefore stopped toning after 3-1/2 minutes.

Final wash: 30 minutes



TONER: KODAK RAPID SELENIUM TONER

Print page number : 142

Paper . . . . . : Center F3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : 6 minutes

. . . . .

#### Observations:

At two minutes of toning the image is markedly cooler in color. At approximately 6 minutes the print is toned smoothly although some splitting is apparent. The print is definitely cooler than the original. The use of a different developer with the same paper will produce significantly different results with this toner.

Final wash: 30 minutes







TONER: KODAK RAPID SELENIUM TONER

Print page number : 144

Paper . . . . . : Seagull G3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 minutes, no hardener

Toner, temperature: 70°F

Toner, time . . . : 2 minutes

. . . . .

Observations:

Used at 1:15 dilution the toner takes very quickly and very smoothly giving the print an overall purplish color. It does not appear to split.

Final wash: 30 minutes



TONER: KODAK RAPID SELENIUM TONER

Print page number : 146

Paper . . . . . : Seagull G3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : 2 minutes

. . . . .

#### Observations:

With this developer the results obtained are very similar to the combination of Seagull and GAF 130 with slightly less color change. The toner acts quickly and smoothly.

Final wash: 30 minutes



## KODAK SEPIA TONER

Kodak Sepia Toner is a bleach and redevelop toner specifically recommended to produce warm brown tones on cold tone papers. Results are generally less satisfactory with warm tone enlarging papers as the toning process seems to reduce the depth in the blacks considerably.

The toner is very easy to mix and use. Only one packaged form is available to make 1 quart each of bleach and toner. To mix start with 32 ounces of water and dissolve the contents of the packet, Part A, and stir. This will be the Bleach Bath, which is predominately composed of potassium ferricyanide. To prepare the Toning Bath, start with 32 ounces of water and dissolve the contents of the packet, Part B, and stir.

To use, prints to be toned should be slightly darker than normal and washed free from fixer before toning. Place the print in the Bleach Bath and agitate until the blacks have disappeared or turned light yellow. To get consistent results each individual print should be bleached to the same extent. Then rinse the print thoroughly in running water for about 2 minutes. Now place the print in the Toning Bath and agitate until there is no further change in color. This will usually be very quick, around 30 seconds. Final wash will be approximately 30 minutes at 65 to 70°F. Occasionally some of the

softer emulsion papers, such as Agfa Portriga Rapid, will need hardening after toning.

Several precautionary measures are necessary when using this or any sulfide bleach and redevelop toner. Do not use metal trays or any metal storage containers as this will produce blue stains. Do not let Part B, the Toning Bath, come into contact with any acid, specifically glacial acetic acid used as common stop bath, as it will liberate poisonous gas. Use good ventilation and wear rubber gloves, especially with Part B, which contains sodium sulfide.

Through the interaction of the bleach and redeveloper, the Sepia Toner converts silver into sulfide of silver. Therefore the print will be even more permanent, for the silver sulfide will be less susceptible in reaction to contaminating atmospheric conditions.

I found Kodak Sepia Toner to be consistent and reliable. It does produce a great amount of color, is inexpensive, and very simple to use. However, especially with Center, the results were unsatisfactory because of the lack of depth in the blacks. Therefore I would not recommend the use of this toner with this particular kind of warm tone paper.

TONER: KODAK SEPIA TONER

Print page number : 150

Paper . . . . . : Center F3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : to completion

. . . . .

Observations:

The resulting color is a pale warm orange brown. There is a clear loss of contrast due to bleaching of the blacks.

Final wash: 30 minutes





TONER: KODAK SEPIA TONER

Print page number : 152

Paper . . . . . : Center F3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : to completion

. . . . .

#### Observations:

Virtually the same results are obtained as with Center and Dektol except a slight cooling of the brown can be observed as well as a small increase in contrast due to the use of GAF 130.

Final wash: 30 seconds



TONER: KODAK SEPIA TONER

Print page number : 154

Paper . . . . . : Seagull G3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : to completion

. . . . .

Observations:

A rich and smooth cold brown is obtained with the paper-toner combination.

Final wash: 30 minutes



TONER: KODAK SEPIA TONER

Print page number : 156

Paper . . . . . : Seagull G3

Developer . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : to completion

. . . . .

#### Observations:

The color achieved is the same as with Seagull and GAF.  
The print is slightly less contrasty due to the use of Dektol.

Final wash: 30 minutes







## LIVER OF SULPHUR TONER

The Liver of Sulphur Toner is a direct sepia toner and is very easy to mix and use. The solution of Liver of Sulphur is a mixture of potassium sulfate and potassium polysulfide, and is similar in reaction to the hypo-alum sepia toners. The formula calls for:

Liver of Sulphur (Polysulfide) . . . . .	1.5 grams
Water to make. . . . .	1000 mL

I used the toner at 68°F for from 7 to 20 minutes. As liver of sulphur has a softening effect on the emulsion, it is necessary to use a hardening fixing bath for the prints that are to be toned with it. The toning solution becomes quite milky with use. However this does not impair the properties of the solution. After toning wash for at least 30 minutes. Use gloves and adequate ventilation when mixing and using this toner as liver of sulphur is a poison. Do not breath dust or vapors, and do ont let it come into contact with eyes or skin.

I found this toner to be simple to mix and use, nevertheless of extreme beauty. Center reacts quite differently

according to the developer, and the resulting prints with both kinds of paper are smooth, luminous and of various brown colors.

TONER: LIVER OF SULPHUR TONER

Print page number : 160

Paper . . . . . : Center F3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, with hardener

Toner, temperature: 68°F

Toner, time . . . : 7 minutes

. . . . .

#### Observations:

The resulting color is a warm brown with a slight red cast. Prints are somewhat split, since after 7 minutes of toning some of the shadow areas are still gray-black. Whites are clear and luminous; no bleaching seems to occur as in most sepia toners.

Final wash: 30 minutes



TONER: LIVER OF SULPHUR TONER

Print page number : 162

Paper . . . . . : Center F3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, with hardener

Toner, temperature: 68°F

Toner, time . . . : 10 minutes

. . . . .

#### Observations:

At 10 minutes toning, the print is fully toned. The color achieved is warm reddish-brown and the print is of extreme clarity and brilliance. By producing such luminous prints, this toner could be compared in quality to a gold toner.

Final wash: 30 minutes



TONER: LIVER OF SULPHUR TONER

Print page number : 164

Paper . . . . . : Seagull G3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, with hardener

Toner, temperature: 68°F

Toner, time . . . : 20 minutes

. . . . .

Observations:

At 20 minutes toning is complete. A rich, deep cool brown is achieved and the print is extremely brilliant and clear.

Final wash: 30 minutes





TONER: LIVER OF SULPHUR TONER

Print page number : 166

Paper . . . . . : Seagull G3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, with hardener

Toner, temperature: 68°F

Toner, time . . . : 20 minutes

. . . . .

Observations:

With this paper-developer combination, the toned print is slightly warmer than Seagull and Dektol. Still, the resulting color is a strong and rich cool brown.

Final wash: 30 minutes



## NELSON GOLD TONER

Nelson Gold Toner produces excellent rich tones that vary from just a hint of warm brown to rich sepia tones depending upon the time of toning. The print can be removed from the bath as soon as the desired tone is obtained. The toner is somewhat tricky to mix and the solution has to be used at between 100 and 110°F; the working solution, though, is extremely longlasting and it gives the prints excellent permanency. The following formula makes 4 liters of working solution.

## Stock Solution A (Solution 1 + Solution 2)

To prepare Stock Solution A, two solutions (called Solution 1 and Solution 2) will be prepared first and then mixed.

## Solution 1

Water (125°F/52°C) . . . . .	3000 mL
Sodium Thiosulfate, anhydrous. . . . .	611 grams
Potassium Persulfate . . . . .	120 grams
Water to make. . . . .	.4000 mL

Sodium thiosulfate, pentahydrate, can be used instead of the anhydrous form. Use 960 grams.

Dissolve the sodium thiosulfate in the warm water, then stir the bath vigorously while adding the potassium persulfate. The solution should turn milky white; if it does not turn milky white, the solution is not warm enough. I used a hot plate in order to keep the solution at temperature. In a separate container prepare Solution 2.

#### Solution 2

Water (at about 68°F/20°C) . . . . .	64 mL
Silver Nitrate . . . . .	5.2 grams
Sodium Chloride (Table salt) . . . . .	5.2 grams

Add the silver nitrate to the water and stir until all of the solid has been dissolved. All of the silver nitrate must dissolve before adding the sodium chloride, otherwise solid silver nitrate will be trapped in the solid that forms. Then add the sodium chloride; that will cause a white precipitate to form. Stir vigorously.

To combine Solution 1 and 2: Before they are combined to make Solution A, both solutions, 1 and 2, must be at room temperature (around 68°F/20°C). Stir Solution 2 to disperse the solid throughout the solution, then pour all of Solution 2 (precipitate included) into Solution 1. Stir to ensure thorough mixing; at this point, a precipitate may or may not be present. Transfer Stock Solution A to the storage container

along with any precipitate, if present.

#### Stock Solution B

Water (68°F/20°C) . . . . . 250 mL

Gold Chloride . . . . . 1.0 gram

Because of the small amount of gold chloride used in this toner, it is imperative that all the gold chloride be transferred to the water. Stir to ensure the solution is homogeneous.

To prepare the working solution: Take one-half of Solution B and add it to Stock Solution A while stirring. The remaining one-half of Stock Solution B is used as a replenisher for the working solution. The bath should not be used until after it has become cold and has formed a sediment.

To tone: Prints to be toned should be washed for a few minutes after fixing before they are placed in the toning solution. Dry prints should be soaked thoroughly in water before toning. Keep at hand an untoned print for comparison during toning. Prints should be separated at all times to insure even toning.

Very carefully, pour the clear solution into a tray. Do not pour the sediment into the toning tray. Heat the solution to 110°F and keep the temperature between 100° and 110°F. To ease the process I used a water jacket and stainless steel trays.

When the desired tone has been reached (usually between 5 and 20 minutes), remove the prints and rinse in cold water. Then fix for about 5 minutes and final wash for about an hour. When finished toning return the working solution to its storage container.

The bath should be revived at intervals by the addition of gold Solution B. The exact amount cannot be given as it depends upon the number of prints toned and the time of toning. About 4 mL of Solution B should be added to the working solution after fifty 8x10" prints or their equivalent have been toned.

A few words of safety: use rubber gloves throughout the whole process. In addition special care must be taken when using this toner because of the following three chemicals: potassium persulfate, silver nitrate and gold chloride. Do not let any of the three chemicals come into contact with the skin and dispose of the excess solids by washing down the drain.

I have found Nelson Gold Toner to be a quite versatile, subtle and unusual toner. Toned prints are brilliant and none of the greenish tone so peculiar to an untoned print remains. The color achieved will vary considerably, depending upon the kind of paper and developer used and the length of toning time. I toned the prints for an average of 8 to 10 minutes which



does not produce a strong coloration of the image. I did so because Nelson Gold Toner is mostly used to warm up the image without too great a degree of color shift. Moreover the toner provides great permanency and stability. Therefore, the toner is effective in its subtle changes toward a warm brown. If longer toning times will be used, a significant shift in color toward red-brown will occur.

TONER: NELSON GOLD TONER

Print page number : 173

Paper . . . . . : Center F3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 110°F

Toner, time . . . : 8 minutes

. . . . .

#### Observations:

The toner acts quickly. The color achieved is a subtle warm brown with a slight, almost imperceptible yellow cast to it. The print is clear and luminous.

Final wash: 1 hour final wash after 5 minutes fixing



TONER: NELSON GOLD TONER

Print page number : 175

Paper . . . . . : Center F3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 110°F

Toner, time . . . : 8 minutes

. . . . .

#### Observations:

Results with Center and GAF are somewhat less evident than with Center and Dektol. There seems to be no yellowish cast to the print. The effect is a warm and gentle brown, and a special, peculiar luminosity so characteristic of gold toning. The color achieved is unusual in its tonality; it is gold brown instead of a reddish brown, as is so typical with this kind of paper when toned with sepia or brown toner.

Final wash: 1 hour after 5 minute fixing



TONER: NELSON GOLD TONER

Print page number : 177

Paper . . . . . : Seagull G3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 110°F

Toner, time . . . : 10 minutes

. . . . .

#### Observations:

With this kind of paper, Nelson Gold Toner produces a less pronounced brown tone overall but a deeper and richer color. It makes a toned print look clearer than a regular print and it adds subtle dark brown hints to it.

Final wash: 1 hour after 5 minutes fixing





TONER: NELSON GOLD TONER

Print page number : 179

Paper . . . . . : Seagull G3

Developer . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 110°F

Toner, time . . . : 10 minutes

. . . . .

#### Observations:

A slightly warmer brown is achieved with this combination of paper and developer.

In summation, I would say that Nelson Gold Toner is extremely dependant upon the kind of paper used and that variations, though not as significant, can occur with the use of different developers.

Final wash: 1 hour after 5 minutes fixing



RED TONES WITH THIOCARBAMIDE  
AND GOLD CHLORIDE (SEPIA FIRST)

This toner is excellent for obtaining vivid orange and red tones. The toning is carried out in two separate steps. First, tone the prints sepia in the bleaching and redeveloping solution (I used Kodak Sepia Toner, see p.147). Then wash the prints thoroughly for at least half-an-hour. Immerse the prints in the thiocarbamide and gold chloride solution described on p.18 and use so as to produce grayish-blue tones on untuned prints. Very intense and unique tonalities are given by this combination of toners. I believe any bleach and redevelop sepia toner could be used in order to obtain similar results to the ones described hereafter. The toning time and temperature in the individual sheets accompanying each single print refer to the thiocarbamide and gold chloride toner.

TONER: RED TONES WITH THIOCARBAMIDE  
AND GOLD CHLORIDE (SEPIA FIRST)

Print page number : 182

Paper . . . . . : Center F3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 96°F

Toner, time . . . : 5 minutes

. . . . .

Observations:

The result is a brilliant orange-red chalk color. The toner seems to affect both the whites and the darks.

Final wash: 30 minutes



TONER: RED TONES WITH THIOCARBAMIDE  
AND GOLD CHLORIDE (SEPIA FIRST)

Print page number : 184

Paper . . . . . : Center F3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 96°F

Toner, time . . . : 5 minutes

. . . . .

#### Observations:

A virtually identical color as obtained with Center and Dektol is produced on Center and GAF. However, the increased contrast of a print developed with GAF 130 produces somewhat intensified shadows and a slight cooling effect.

Final wash: 30 minutes







TONER: RED TONES WITH THIOCARBAMIDE  
AND GOLD CHLORIDE (SEPIA FIRST)

Print page number : 186

Paper . . . . . : Seagull G3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 96°F

Toner, time . . . : 5 minutes

. . . . .

#### Observations:

A beautiful and brilliant chalk red color is obtained with this toner on this paper, regardless of the developer used.

Final wash: 30 minutes



TONER: RED TONES WITH THIOCARBAMIDE  
AND GOLD CHLORIDE (SEPIA FIRST)

Print page number : 188

Paper . . . . . : Seagull G3

Developer . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 96°F

Toner, time . . . : 5 minutes

. . . . .

#### Observations:

No difference can be seen because of the use of a different developer. Again, the result is a strong and intense chalk red.

Final wash: 30 minutes



## SELENIUM BLEACH AND REDEVELOP TONER

This toner is an alternative to the single solution selenium toners. The final image is a complex silver-selenosulfide combination which is quite permanent. The colors obtained range from a rich purple to warm, red-browns.

The formula calls for two solutions, A and B. Solution B contains selenium powder which needs to be dissolved in hot water. Selenium is a poison similar to arsenic and the fumes given off by the solution as it is being heated are quite toxic. Good ventilation is imperative. I used a hot plate under a fume hood and I wore a mask. This shouldn't be a kitchen procedure.

## Solution A

Water, warm (ca. 100°F/38°C) . . . . .	.750 mL
Potassium Ferricyanide . . . . .	.100 grams
Potassium Bromide. . . . .	.100 grams
Add cold water to make . . . . .	.1 liter

To make solution A, dissolve the chemicals in the order given above.

## Solution B

Water, warm . . . . .	750 mL
-----------------------	--------

Sodium Sulfide . . . . .	104 grams
Selenium Powder. . . . .	6.8 grams
Add cold water to make . . . . .	.1 liter

To make Solution B, dissolve the 104 grams of sodium sulfide in the 750 mL of warm water, then heat the solution to boiling while adding 6.8 grams of selenium powder. Solution of the selenium will take some time, and it is necessary to continue heating the mixture until complete solution takes place.

To use, Solution A is diluted 1:9 with water. Solution B is diluted 1:10 with water.

To tone the prints, first immerse them in dilute Solution A for a few minutes, until they reach a straw color. After bleaching, rinse the prints in running water for 2 to 3 minutes. Then immerse them in Solution B, diluted as well. The prints should be agitated gently for 2 or 3 minutes, and the final washed thoroughly. Prints should be very well fixed and washed prior to toning. The final color of the toned print is influenced by a number of factors, including the type of paper used, the developer and the time of developing, and even the pH of the water. Eventually the bleach will fail to bleach and the redeveloper will no longer redevelop. Discard both baths when the action becomes too slow. However both stock solutions, undiluted, will keep very well.

This toner differs from Kodak Rapid Selenium Toner in that it will produce much more color. However, some problems occurred during the process. Staining occurred quite often and the reason for this is unclear. The prints used for toning were all fixed and washed thoroughly and a residual hypo test was performed in order to insure complete washing. Staining was apparent on Center but no on Seagull. This toner should therefore be mixed and used with extreme care in order to avoid any form of chemical contamination.

The range of colors obtained spans from a reddish hue to a cool brown.



TONER: SELENIUM BLEACH AND REDEVELOP TONER

Print page number : 193

Paper . . . . . : Center F3

Developer . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : Solution A: 2 minutes; Solution B: 3 minutes

. . . . .

Observations:

. This combination of paper and developer produces a color that is reddish brown.

Final wash: 30 minutes



TONER: SELENIUM BLEACH AND REDEVELOP TONER

Print page number : 195

Paper . . . . . : Center F3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : Solution A: 2 minutes; Solution B: 2 minutes

. . . . .

Observations:

Results are similar to the Center/Dektol print except for a slightly more pinkish color.

Final wash: 30 minutes



TONER: SELENIUM BLEACH AND REDEVELOP TONER

Print page number : 197

Paper . . . . . : Seagull G3

Developer . . . . . : GAF 130

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : Solution A: 2 minutes; Solution B: 2 minutes

. . . . .

#### Observations:

The toner works well with this cold tone enlarging paper. The print is luminous and clear with a rich and contrasty purple brown color.

Final wash: 30 minutes





TONER: SELENIUM BLEACH AND REDEVELOP TONER

Print page number : 199

Paper . . . . . : Seagull G3

Developer . . . . . : Dektol

Fixer . . . . . : Sprint 1:4, 30 seconds, no hardener

Toner, temperature: 70°F

Toner, time . . . : Solution A: 2 minutes; Solution B: 3 minutes

. . . . .

#### Observations:

Results are similar to those obtained with the Seagull/GAF 130 combination except that Dektol produces a print of slightly less contrast. The toned image is a clear purple brown.

Final wash: 30 minutes





## CONCLUSION

It is hoped that the preceding demonstration of interaction between chemical toners and two enlarging papers with two different developers has been helpful. To my knowledge nowhere is this information described visually so that actual comparisons can be made from print to print. Adding to that difficulty has been the nonexistent centralization of relevant information about toners. The involved photographer had to sift through various technical manuals and lab indexes simply to find the most rudimentary of formulas. Several of the most wonderful, and unusual, of toning formulas described in this thesis came from books long out of print. Although manufacturers do supply premixed packages of toners that are relatively easy to use, the most extraordinary and beautiful must be mixed from raw chemistry. It should be stressed here, however, that the primary difficulty in chemical toning black and white prints is repeatability. I have tried to increase the chances of the reader's success by using distilled water wherever possible. The relative pH of the water will have a very great deal of effect upon the eventual color achieved with most true chemical toners. In addition, although I chose two kinds of high quality paper somewhat typical of readily commercially available types, each manufacturer's offerings

will change the end results as well. If a specific project is to be toned one way, I would recommend at least some brief tests first with the paper, developer, and toner desired to see if all three are compatible.

Although it may be a cliché to say, there is a wonderful world of colors available to the black and white photographer and I sincerely hope that this thesis was not only helpful to that end but also visually interesting as well.

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## WHERE TO FIND PHOTOGRAPHIC CHEMICALS AND SUPPLIES

Anachemia Chemicals, Inc., Boston, MA, Tel. 354-7880 (just chemicals).

Fisher Scientific, 461 Riverside Ave., P.O. Box 379, Medford, MA 02155, Tel. 391-6110 (supplies and chemicals).

Merrill Scientific, 1665 Buffalo Road, Rochester, N.Y., 14624, Tel. (716) 426-1540 (supplies and chemicals).

MIT Office of Laboratory Supplies, Cambridge, MA 02139.  
Tel. 253-1000 (some photographic chemicals and supplies).

Photographers' Formulary, Box 5105, Missoula, MT 59806-5105,  
Tel. 1-800-922-5255 (virtually all photographic chemicals  
as well as some prepackaged toning kits).

Zone U, Inc., Box 811, Brookline, MA 02147-0811. Tel. 277-5609  
(some supplies and chemicals).